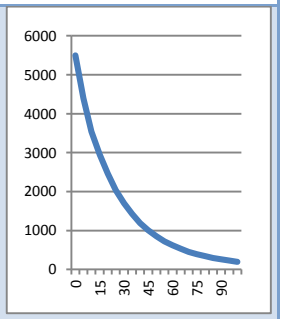
Sensor Datasheet and Installation Instruction (Issue 15 12/6/15)

Air Charge Temperature

Universal sensor suitable for most after-market engine management systems that use thermistor-type sensors. M10x1.25 parallel thread. Copper sealing washer supplied.

Air Charge Temperature Sensor	
Approximate Resistance vs. Temperature	
Temp	R ohms
0	5500
5	4400
10	3540
15	2950
20	2460
25	2040
30	1700
35	1430
40	1190
45	1010
50	850
55	720
60	620
65	530
70	450
75	390
80	340
85	295
90	260
95	230
100	195

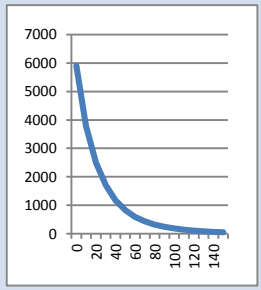


Wire Colour	FUNCTION
Black	Sensor ground
Yellow	Signal

Oil Temperature

Universal sensor suitable for most after-market engine management systems that use thermistor-type sensors. M12x1.5 thread[1]. PTFE tape recommended.

Oil Temperature Sensor	
Approximate Resistance vs. Temperature	
Temp	R ohms
0	5896
10	3792
20	2500
30	1707
40	1175
50	834
60	596
70	436
80	323
90	243
100	187
110	144
120	113
130	89
140	71
150	57



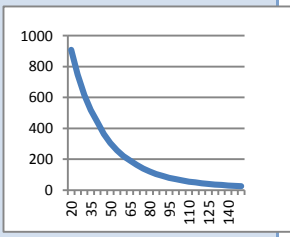
Wire Colour	FUNCTION
Black	Sensor ground
White	Signal

[1] Sensors originally supplied had a 1/8" NPT thread and used a different linearisation. The newer sensor can be identified as it has short wire tails ending in a connector, rather than a connector as part of the sensor body.

Coolant Temperature

Universal sensor suitable for most after-market engine management systems that use thermistor-type sensors. 1/8" NPT tapered thread. PTFE tape recommended.

Coolant Temperature Sensor	
Approximate Resistance vs. Temperature	
Temp	R ohms
20	910
25	750
30	615
35	520
40	440
45	360
50	300
55	260
60	220
65	190
70	165
75	140
80	120
85	104
90	91
95	79
105	62
110	54
115	49
120	44



Wire Colour	FUNCTION
Black	Sensor ground
Violet	Signal

Knock Sensor

Type	BOSCH wideband
Diameter	28mm, 8.4mm mounting hole
Sensitivity	26±8mV/g
Frequency Response	1-20kHz
Impedance	1MΩ
Min Capacitance	800pF
Max Capacitance	1600pF
Operating Temp.	-40°C to 130°C

Wire Colour	FUNCTION
Black	Sensor ground
White	Sensor signal
Grey	Cable screen/chassis GND

Flex Fuel Sensor

Type	Continental
Dimensions	155x70x40 mm
Pipe Diameter	3/8" SAE. -6AN optional
Weight	135g
Power Supply	+12V
Output	Open collector PWM (needs pullup and software decoding of the output signal)

Wire Colour	FUNCTION
Black	Sensor ground
Orange	+12V
Purple	Signal

KA MAP Sensors

Type	KA Sensors ASMP
Dimensions	34mm long, 28mm diameter, plus 15mm long hose barb or 1/8" NPT male thread
Barb hose diameter	4mm
Construction	Stainless steel, alumina, Viton, FEP
Weight	35g
Operating Temp.	-20°C to 100°C
Pressure Range	0-3 bar or 0-4Bar Bar linear absolute
Max Pressure	6 Bar
Power Supply	+5V
Output, min pressure	0.5V
Output, Full Scale	4.5V
Accuracy	±0.5% FS
AlcaTek "M" Value	3 Bar 3.66 4 Bar 4.89
AlcaTek "C" Value	3 Bar -375 4 Bar -500

Wire Colour	FUNCTION
Black	Sensor ground
Red	Sensor +5V
Grey	Signal

Exhaust Gas Temperature

Type	KA Sensors KTC Series
Dimensions	100mmx3mm probe with 25mmx8mm diameter seal
Cable	1m or 2m, metal braided PTFE wires
Connector	Mini-K
Construction	Inconel steel
Probe Operating Temp.	-100°C to 1100°C
Cable Operating Temp	-75°C to 250°C
Min probe bend radius	20mm
Compression gland	1/8"NPT – others available on request.

10 Bar Stainless Steel Oil/Fuel Pressure Sensor

Universal sensor, suitable for most after-market engine management systems that use ratiometric gauge sensors.

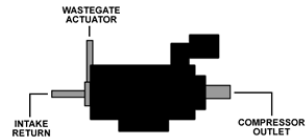
Type	KA Sensors ASMP
Dimensions	34mm long, 28mm diameter, plus 12mm fitting thread
Fitting	1/8" NPT male
Construction	Stainless steel, alumina, Viton, FEP
Weight	35g
Operating Temp.	-20°C to 125°C
Pressure Range	0-10Bar linear gauge
Max Pressure	15 Bar
Power Supply	+5V
Output, min pressure	0.5V
Output, Full Scale	4.5V
Accuracy	±0.5% FS
AlcaTek "M" value	12.21
AlcaTek "C" value	-1250

Wire Colour	FUNCTION
Black	Sensor ground
Red	Sensor +5V
Orange *or* Blue	Signal

3 port Boost Control Solenoid

Type	Pierburg
Dimensions	72mmx45mmx28mm
Cable	1m or 2m, metal braided PTFE wires
Connector	2 pin Junior Timer
Pipe connections	6mm hose barb

Wire Colour	FUNCTION
Black	Solenoid pin 1
Brown	Solenoid pin 2



Installation Instructions

Sensors – General

Please note that the 3-pin pressure sensor connectors supplied with the sensor pack are a "pull through" type. You must push the wires through the rear seal and out of the front of the connector before you crimp the terminals, then pull the terminals back through the connector body until they click in to place.

Handle the sensors with reasonable care – dropping them may damage the sensor element. Threads of air and fluid sensors (not Lambda sensors) should be wrapped with a few turns of PTFE tape to aid sealing and sensors should be tightened carefully to about 20-25Nm (14-18 ftlb).

Oil pressure sensors should ideally be mounted using a "remote" hose to minimise vibration – a fitting kit is available from us, as detailed below.

Note – Syvecs sensor database files for all JT Innovations sensors are available for download from our website. The database files are "units-dependent" and the units in SCal must match those in the files (pressure: Bar; and temperature: Celsius).

Subaru Oil Fitting Kit

The fitting kit comprises:

- 300mm braided hose with 1/8" BSPT female threaded ends
- 1/8" BSPT taper to 1/8" BSPT parallel thread adapter
- M18x1.5 male to 1/8NPT or M12x1.5 (depending on sensor supplied) female adapter with sealing washer
- Remote T-piece adapter
- Mounting clip

This kit allows the OEM oil pressure switch to be retained. Installation is generally as follows.

- Remove OEM oil pressure switch. This is located under the alternator and access is generally easier if you remove the alternator first.
- Wrap a few turns of PTFE tape around the tapered end of the 1/8" taper to 1/8" parallel thread adapter and screw it in to the hole in the block where the OEM pressure switch was. Tighten.
- Wrap a few turns of PTFE tape around the parallel end of the adapter just fitted and attach the braided hose. Tighten.
- Wrap a few turns of PTFE tape around the male thread on the end of the remote t-piece adapter and attach the other end of the braided hose to it. Tighten.
- Wrap a few turns of PTFE tape around the OEM pressure switch and around the oil pressure sensor and attach these to the t-piece. Tighten carefully.
- Use the mounting clip to attach the t-piece and sensor in a convenient location.

- Remove the oil gallery plug located on the top of the engine block above cylinder 3. You will need to remove the top-mount intercooler to gain access. It is fitted very tightly and needs a proper 8mm hex drive socket with a decent wrench to remove it.
- Insert the M18x1.5 male to 1/8NPT (or M12x1.5) female adapter to the oil gallery plug hole, using the sealing washer provided. Tighten well.
- Wrap PTFE tape around the threads of the oil temperature sensor, insert, and tighten carefully.
- Re-assemble any parts removed, start the engine and check VERY CAREFULLY for leaks!

Cable Assemblies

The cables supplied with each sensor click in to place: pressure sensor connectors just need to be carefully pushed on to the sensor until the tab locks; temperature sensors use "Junior Power Timer" connectors, and the steel spring clip needs to be squeezed in towards the body of the connector to make it easier to push the connector home.
Route the cables as required, using the cable ties (supplied) to make the installation neat. Cables are usually routed to the ECU through the large rubber grommet that the main ECU cable harness uses. This is on the engine bulkhead above the passenger foot-well. VERY carefully pierce a hole in this and push the cable ends through.
The cable ends need to be connected to the ECU as required. Cable colour coding is as follows, although occasionally different wire colours may be used if the usual colour wire is not available at time of manufacture:

COLOUR	FUNCTION
Black	Sensor ground
Red	Sensor +5V
White	Oil temperature
Yellow	Air Charge Temperature
Orange *or* Blue	Pressure (e.g. Fuel or Oil)
White/Black twisted pair	Knock (grey wire is cable screen)
Grey	MAP
Brown	3 port boost control solenoid

Subaru-Specific Loom

Installation of this loom follows the general principles above, with the +5V and analogue grounds ready-commoned for connection at the ECU end. A 12-way connector is supplied which may be used to pick up sensor power when using a Syvecs S6PnP ECU.

AVCS Loom

This has dedicated connectors for the AVCS CAM sensors and AVCS solenoids (with coding pegs preventing then being plugged in incorrectly). On a right-hand drive vehicle, it runs from the right head (drivers side), along the inlet manifold, picks up the left head connections and then should be run to the rear bulkhead. For left hand drive vehicles it can be fitted the other way around if required.

A multiway connector is provided to allow the loom to be detached should the engine need to be removed. It then passes through the engine bay grommet to the ECU.

Various versions are available depending on whether 2 or 3 pin cam sensors are used, and then in a generic/Syvecs version, or a specific version for AlcaTek ecus.

Generic/Syvecs Connections – 2 pin CAM sensors

COLOUR	FUNCTION
Black	Sensor ground
Red	+12V – AVCS solenoid power
Violet	Right AVCS solenoid drive
Green	Left AVCS solenoid drive
White	AVCS cam sensor signal (labelled left or right)
Grey	Chassis ground (cam sensor cable screens)

Generic/Syvecs Connections – 3 pin CAM sensors

COLOUR	FUNCTION
Black	Sensor ground
Red	+12V – AVCS solenoid power
Violet	Right AVCS solenoid drive
Green	Left AVCS solenoid drive
Yellow	Left AVCS cam sensor signal
White	Right AVCS cam sensor signal
Orange	3 pin cam sensor +12V

A plug is provided, for Syvecs ECUs, that connectors to the “AUX” connector of a PnP ECU to pick up sensor +12V, sensor ground, and +12V for the AVCS solenoids, using colour coded bullet connectors.

AlcaTek

The AlcaTek version is fully “plug-and-play”, for all versions except MY01-onward WRX models, with 8 and 4 way sockets for direct connection to the ecu. WRX models will need the sensor wires wired in to the existing loom and ECU connector – see sensor wiring information below.

CAL Switch

Unless equipped with Subaru-specific connectors that allow direct connection to the "test" connectors under the steering wheel (assuming the Syvecs calibration is set to use that as the CAL switch input), the CAL switch is wired as follows:

COLOUR	FUNCTION
Black	Ground (fitted with a Subaru female terminal for the Subaru "test" connectors)
Grey	Syvecs input (fitted with a male terminal for the Subaru "test" connectors).

If ordered as a "3 wire" type (e.g. for use with AlcaTek ECUs), the wire colours are as follows:

COLOUR	FUNCTION
Black	Ground
White	ECU input
Red	May be connected to +5V if the ECU input used does not have a pull-up resistor to +5V incorporated. If not needed, it can be ignored but should be insulated to avoid accidental short circuits.

Wiring of Sensors to Subaru Impreza Vehicles

This information is provided for general information only and in good faith. The suggestions of which pins to use for various Subaru model years should be checked with your installer, in case of conflict with other modifications. This is especially true of Syvecs installations as the choice of pins to use is more varied than with AlcaTek. Pins suggested avoid the need for external pullup resistors: other pins could be used but it the work is then more involved.

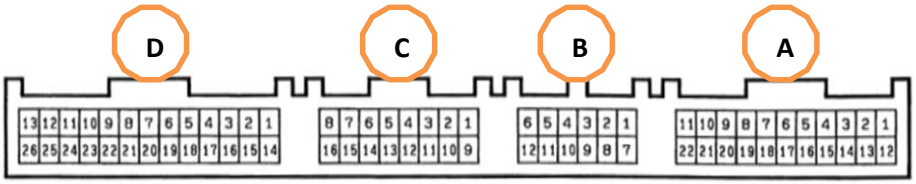
All connector images are shown looking in to the ECU itself, with pin 1 at the top right of each connector. Please note that connector labelling varies from source to source – including Subaru - so what you see here may well not match information from other places.

When wiring sensors to an existing ECU installation do NOT cut the sensor power and ground wires – these must remain connected to the ECU, and the new sensor wires spliced to them in addition. Generally, however, sensor signal wires will REPLACE the existing wire entering the ECU so you must cut the wire, leaving a short tail on the ECU connector, and join the sensor wire to the short tail. Insulate the cut wire that is part of the vehicle loom.

All information is given in good faith, however it is strongly recommended that the information is checked against vehicle wiring diagrams and/or that an experienced auto electrician is consulted.

MY92-96

All connector images are shown looking in to the ECU itself, with pin 1 at the top right of each connector. Please note that connector labelling varies from source to source – including Subaru - so what you see here may well not match information from other places.

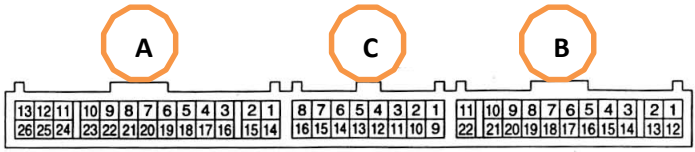


Function	AlcaTek (E1S96) Pin	Syvecs Pin
Air Temp	A5 or A9	A9 (AU3), C6 (AU4), C12(AR3) or C13(AR2)
Oil Temp	A9 or A5	A9 (AU3), C6 (AU4), C12(AR3) or C13(AR2)
Fuel Pressure	A18	C6 (AU4), C12(AR3) or C13(AR2)
Oil Pressure	B7	C6 (AU4), C12(AR3) or C13(AR2)
Flex Fuel	n/a	C7(AB3), C8 (AB4) or C6 (AU4)
Sensor Ground	A21	A21 or AUX connector pin 9
Sensor +5V	A3	A3 or AUX connector pin 10
AVCS Solenoid, L control	N/A	D6 (INJ5) (will lose canister purge)
AVCS Solenoid, L +12V	N/A	Splice *with* A2 or A13 or use other Switched Vbatt feed
AVCS Solenoid, R control	N/A	D20 (INJ6) (will lose MAP/BAP exchange solenoid)
AVCS Solenoid, R +12V	N/A	Splice *with* A2 or A13 or use other Switched Vbatt feed
AVCS Cam sensor, L+, white	N/A	C7 (AB3) (will lose diag port)
AVCS Cam sensor, L, black	N/A	Splice *with* A21 or use Aux connector pin 9
AVCS Cam sensor, R+, white	N/A	C8 (AB4) (will lose diag port)
AVCS Cam sensor, R, black	N/A	Splice *with* A21 or use AUX connector pin 9

Note – the polarity of the wiring to the AVCS solenoids is not critical, but it is important to get the AVCS sensor wiring correct otherwise the ECU is unlikely to control the AVCS correctly.

MY97-98

All connector images are shown looking in to the ECU itself, with pin 1 at the top right of each connector. Please note that connector labelling varies from source to source – including Subaru - so what you see here may well not match information from other places.

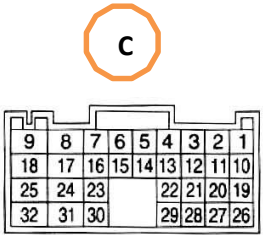


Function	AlcaTek (E1S97) Pin	Syvecs Pin
Air Temp	B6 or B15	C1(AR2), C4(AB3), C5(AB4), B6(AU3), B20(AR30 or B21(AU4)
Oil Temp	B15 or B6	C1(AR2), C4(AB3), C5(AB4), B6(AU3), B20(AR30 or B21(AU4)
Fuel Pressure	B19	C1(AR2), C4(AB3), C5(AB4), B6(AU3), B20(AR30 or B21(AU4)
Oil Pressure	C12	C1(AR2), C4(AB3), C5(AB4), B6(AU3), B20(AR30 or B21(AU4)
Flex Fuel	n/a	C4(AB3), C5(AB4), B6(AU3) or B21(AU4)
Sensor Ground	B13	B13 or AUX connector pin 9
Sensor +5V	B14	B14 or AUX connector pin 10
AVCS Solenoid, L control	N/A	A16 (INJ5) (will lose I/C autowash)
AVCS Solenoid, L +12V	N/A	Splice *with* B1 or B2, or use other Switched Vbatt feed
AVCS Solenoid, R control	N/A	A6 (INJ6) (will lose MAP/BAP exchange solenoid)
AVCS Solenoid, R +12V	N/A	Splice *with* B1 or B2 or use other Switched Vbatt feed
AVCS Cam sensor, L+, white	N/A	C4 (AB3) (will lose diag port)
AVCS Cam sensor, L, black	N/A	Splice *with* B13 or use Aux connector pin 9
AVCS Cam sensor, R+, white	N/A	C5 (AB4) (will lose diag port)
AVCS Cam sensor, R, black	N/A	Splice *with* B13 or use AUX connector pin 9

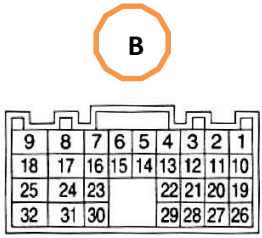
Note – the polarity of the wiring to the AVCS solenoids is not critical, but it is important to get the AVCS sensor wiring correct otherwise the ECU is unlikely to control the AVCS correctly.

MY99-00

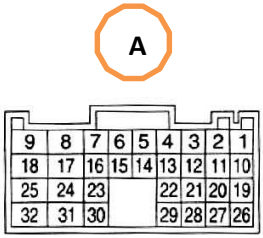
All connector images are shown looking in to the ECU itself, with pin 1 at the top right of each connector. Please note that connector labelling varies from source to source – including Subaru - so what you see here may well not match information from other places.



(B136, Blue)



(B135, Grey)



(B134, Black)

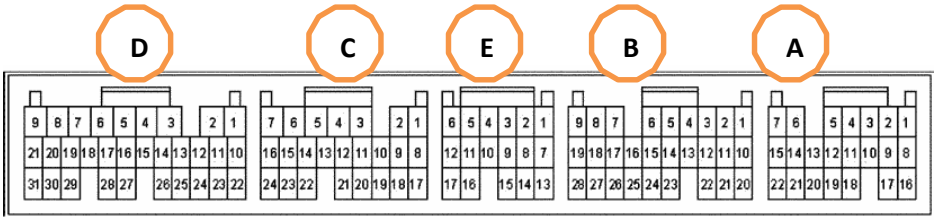
Function	AlcaTek (E1S99) Pin	Syvecs Pin
Air Temp	A1 or A19	A1 (AU3), A4(AB4), A19(AR2) or B13(AR3)
Oil Temp	A19 or A1	A1 (AU3), A4(AB4), A19(AR2) or B13(AR3)
CAL Switch	A1, A14, A19 or B21	A1 (AU3), A4(AB4), A19(AR2) or B13(AR3)
Fuel Pressure	A2	A1 (AU3), A4(AB4), A19(AR2) or B13(AR3)
Oil Pressure	A14	A1 (AU3), A4(AB4), A19(AR2) or B13(AR3)
Flex Fuel	n/a	A1 (AU3), A4(AB4), B1 (AB3) or C4 (AB4)
Sensor Ground	A24	A24 or AUX connector pin 9
Sensor +5V	A12	A12 or AUX connector pin 10
AVCS Solenoid, L control	N/A	C5 (AUX6) or C10 (INJ5) – see note below
AVCS Solenoid, L +12V	N/A	Splice *with* A8 or A9 or use other Switched Vbatt feed
AVCS Solenoid, R control	N/A	C15 (AUX7) or C28 (INJ6) – see note below
AVCS Solenoid, R +12V	N/A	Splice *with* A8 or A9 or use other Switched Vbatt feed
AVCS Cam sensor, L+, white	N/A	B1 (AB3) (will lose steering switch)
AVCS Cam sensor, L, black	N/A	Splice with A24 or use Aux connector pin 9
AVCS Cam sensor, R+, white	N/A	C4 (AB4) (will lose diag port)
AVCS Cam sensor, R, black	N/A	Splice with A24 or use Aux connector pin 9

Note: The MY99-00 Syvecs ECU has little in the way of spare output drives due to the 4 signals required for the idle stepper. If a different idle control valve has been fitted, AVCS solenoids can be driven from AUX 6 and AUX 7 (C5 and C15) but if the original idle control valve is used, the best second choice is probably INJ5 and INJ6 (C10 and C28) but this will then lose the I/C water spray (if fitted) and the check engine warning light.

The polarity of the wiring to the AVCS solenoids is not critical, but it is important to get the AVCS sensor wiring correct otherwise the ECU is unlikely to control the AVCS correctly.

MY01-05

All connector images are shown looking in to the ECU itself, with pin 1 at the top right of each connector. Please note that connector labelling varies from source to source – including Subaru - so what you see here may well not match information from other places.



Function	AlcaTek (E1S02) Pin	Syvecs Pin
Air Temp	D14 or B27	A5(AR3), B13(AU3), B23(AU4), B27(AR2) or E13(AU2)
Oil Temp	B27 or D14	A5(AR3), B13(AU3), B23(AU4), B27(AR2) or E13(AU2)
Fuel Pressure	B13	A5(AR3), B13(AU3), B23(AU4), B27(AR2) or E13(AU2)
Oil Pressure	B23	A5(AR3), B13(AU3), B23(AU4), B27(AR2) or E13(AU2)
Flex Fuel	n/a	B13(AU3), B23(AU4) or E13(AU2)
Sensor Ground	B19	B19 or AUX connector pin 9
Sensor +5V	B9	B9 or AUX connector pin 10
AVCS Solenoid, L control	E12	E16 (AUX1)
AVCS Solenoid, L +12V	E6	E17
AVCS Solenoid, R control	E16	E12 (AUX2)
AVCS Solenoid, R +12V	E17	E6
AVCS Cam sensor, L+, white	E9	E9 (AB3)
AVCS Cam sensor, L, black	E15	E15
AVCS Cam sensor, R+, white	E2	E2 (AB4)
AVCS Cam sensor, R, black	E3	E3
AVCS sensor cable screens	E14	E14

Note – the polarity of the wiring to the AVCS solenoids is not critical, but it is important to get the AVCS sensor wiring correct otherwise the ECU is unlikely to control the AVCS correctly.

Syvecs "AUX" Connector

There is a 12 pin "AUX" connector available at the rear of Syvecs "plug and play" ECUs. This conveniently provides sensor +5V and sensor ground. It also has other signals available, but these vary from model year to model year: check with Syvecs for further information.

The mating connector is shown below:

- Pin 7 = VBat
- Pin8 = Sensor +12V
- Pin 9 = Sensor +5V
- Pin 10 = Sensor Ground

support@JTi.uk.com
www.JTi.uk.com
JT Innovations Ltd
Unit 23, Tradecroft Ind. Est.
Portland, Dorset, DT5 2LN
+44 (0) 1305 534 535